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TITLE OF THE THESIS:

ASSESSMENT OF GROUNDWATER POTENTIAL ZONES IN BHOKAR TALUKA, NANDED DISTRICT, MAHARASHTRA, INDIA.

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SYNOPSIS

ASSESSMENT OF GROUNDWATER POTENTIAL ZONES IN BHOKAR TALUKA, NANDED DISTRICT, MAHARASHTRA, INDIA.

A BRIEF RESUME OF PROPOSED WORK

The proposed work aims to demarcate the potential zones of the groundwater. The study region falls under drought zone. The proposed work is located in Bhokar taluka, district Nanded, Maharashtra, India. Furthermore, hydrological survey and groundwater sampling will be taken from dug well, bore well and Nalla's present in the study area for Quality purpose, The outcome of the study is to give suggestions of recharge structures with respect to suitable sites.

INTRODUCTION TO PROPOSED RESEARCH TOPIC

Groundwater is the only fresh resource for the human survival and habitats on the globe. It drives all the environmental and socio-economic aspect. Due to intense growth in popularization and rapid industrialization, it stresses to groundwater in terms of quantity and quality. The proposed research topic mainly focuses on the delineation of groundwater potential zones of Bhokar taluka, Nanded district, Maharashtra. The region faces scarcity of drinking water in summer season. The expected outcome is to propose groundwater recharge structuresto increase and sustain the groundwater potential of study area with respect to suitable sites.

REVIEW OF LITERATURE

P Arulbalaji et al.,(2019) Made an attempt to demarcate the potential zones using GIS and AHP Technique: a case study from southern wester ghat pf India. The study investigated the groundwater potential zones by preparing Thematic maps such as Geology, Geomorphology, LULC, Rainfall, soil, lineament density, drainage density, Slope etc. Author classified the area into five zones for groundwater potential as very High, High, Moderator, Low and Very Low. The identification of groundwater potential zones based on Thematic maps was also validate by analyzing groundwater flow and groundwater prospect map.

M. Rajashekar et al.,(2022) identify the groundwater potential zones by using geospatial and decision-making approach in southern India. Author gives insight to Remote sensing and GIS tools for the delineation of groundwater potential zones along with Multi criteria Decision approach(MCDA). This study also imports the use of Analytical Hierarchy Process (AHP) Technique for the delineation of groundwater potential zones which help to prepare the Groundwater potential zones map(GWPM).

Sachin P. Shinde et al.,(2024) Assessed the groundwater potential zone in Buchakewadi watershed of junar block of Pune district Maharashtra using AHP and MIF Techniques. This paper focuses on the proposal for the recharge site in the basaltic terrain. The findings also validate AHP and MIF data with the field data.

Saket Raj et al.,(2024) Groundwater potential zones identification and validation in Peninsular India. The study was carried out by using seven criteria of GIS. The Thematic maps were prepared as geology, Geomorphology, lineament, Land use and Land cover, soil, Drainage, slope and based on this map the Groundwater potential map created and the study area was classified accordingly. The various recharge structures are also recommended for augmentation of groundwater potential. The recharge structures as Rooftop Rainwater Harvesting suggested for very low groundwater potential zone, check dam and artificial recharge structure in poor zone.

MM Zewdie et al.,(2024) have studied the Groundwater of zone delineation using GIS and AHP techniques in upper parts of Chemoga watershed, Ethiopia. The Groundwater potential zone was delineated using integrated approach via Remote sensing, GIS, AHP and MCDA. The same result was validated with the field data of bore hole data and dug well data.

Narender Verma et al.,(2021) Demarcated the of groundwater potential zones in lower Rihand River Basin, India using geospatial techniques and AHP. Authors used nine parameters viz. geology, lineament density, geomorphology, soil, rainfall, drainage density, slope, relief, LULC for the preparation of thematic maps and preparation of statistical analysis for AHP technique. Based on this study, the basin is classified into very poor, poor, moderate, good, very good groundwater potential zones. At concluding authors stated that remote sensing, GIS, and AHP technique provide potentially powerful tools for studying the groundwater potential, the final map obtained can be used for sustainable development of groundwater in the study basin.

Vasu Pancholi et al.,(2022 Estimation of groundwater potential zones using remote sensing and geographical information system technique- Waghai Taluka, Dang district, Gujarat, Western India. Authors studied the dang district, southern part of Gujrat which was facing shortage of water in summer despite having high rainfall. A total of 5 attributes that decide the occurrence of groundwater like lineament density, lithotectonic setup, drainage density, geomorphology and slope were used to delineate the groundwater potential zone and the area is divided into two: potential and non-potential ground- water prospecting zones. The resulting groundwater potential zones were cross verified directly with the groundwater level from existing well data.

V. Ajay Kumar et al.,(2019) Identified the Groundwater Potential Zones Using RS, GIS and AHP Techniques in a Part of Deccan Volcanic Province (DVP), Maharashtra, India. The study area located in Chandrabhaga River basin, Nagpur district, Maharashtra. The thematic layers of geology, geomorphology, land use and land cover, slope, drainage density, lineament density, and soil maps were prepared with the help of conventional data, topographic maps, and satellite

image and assigned weights of the individual themes and their corresponding classes using the AHP technique. The integration of all thematic layers in the GIS environment has generated a groundwater potential map of the study area.

STUDY AREA

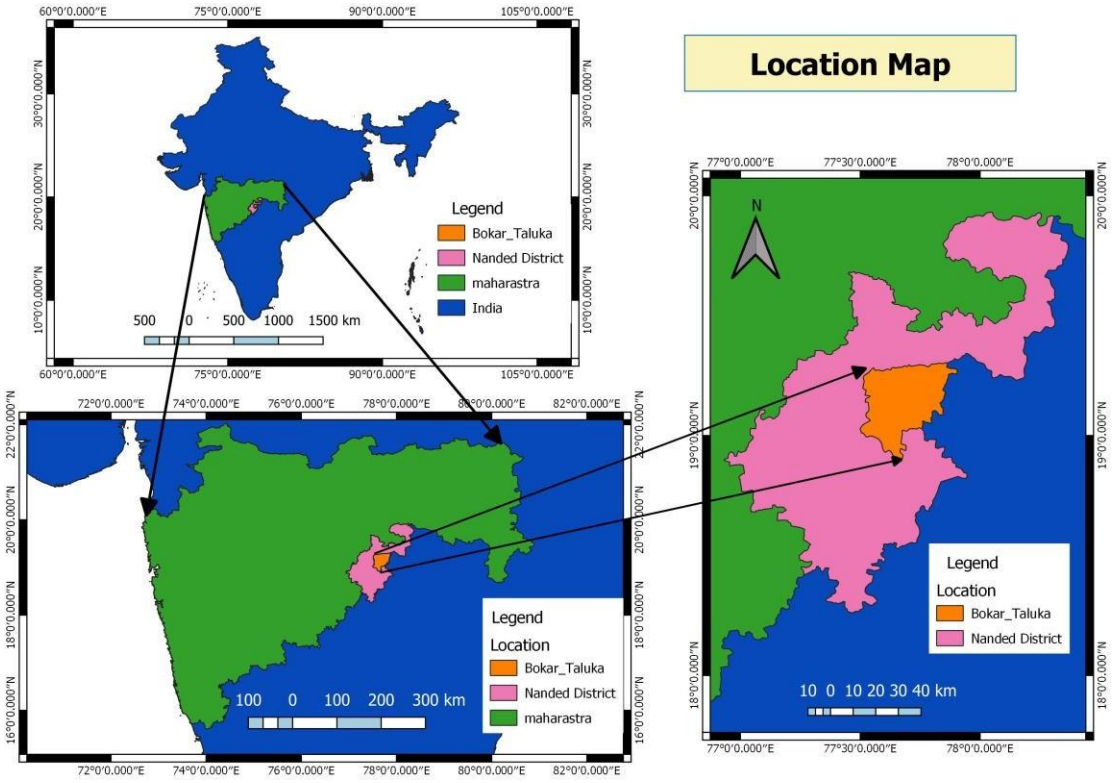

Fig. 1 Location of Study area

The study area is located in Bhokar taluka of Nanded district, Maharashtra, India. Bhokar taluka is of the taluka from the 16 talukas of Nanded district. The study area is lies between this Latitude 18° 52' 30" N to 19° 21' 0" N and Longitude 77° 27' 0" E to 77° 54' 36" E (Fig. 1). The area is falls under Survey of India toposheets numbers 56 E/11, 56 E/12, 56 E/15 and 56 E/16.

The study area covers about 682 Sq Km area of bhokar taluka which is situated in eastern margin of the Nanded district. The rainfall in taluka has large variation over the decade. It received the highest rainfall 1310mm in the year 2016 and lowest as 440mm in the year 2011 with 890.58mm mean decadal rainfall. It experiences the tropical climate with maximum temperature 48ºC to minimum 15ºC with average 35ºC. The population of the bhokar taluka is 1,05,414(Census 2011)

GEOLOGY OF STUDY AREA

Geologically, the major part of the study area covers in the Deccan Traps, with the major

lithological type is Basalt formation of Sahyadri group of Upper cretaceous to Paleocene age. The basaltic formation consists of different basalt flow and Intertrappeans beds. It includes columnar basalt, Amygdaloidal basalt, fractured basalt and soil cover is shallow. Physiographically, the region shows escarpments, plateaus with different slopes and plateaus with weathered zone.

OBJECTIVES

The main aim of the proposed work is the find out the groundwater potential zones and to propose recharge structures to increase and sustain the groundwater potential.

This will achieve through the following objectives

1. To determine the morphometric characteristics of the study area.
2. To determine the groundwater potential zone.
3. To determine the groundwater quality with respect to drinking and irrigation purpose (Two seasons' data).
4. To suggest the remedial measures for recharge the groundwater.

METHODOLOGY

Preliminary surveys will be followed by detailed surveys, Fixation of observation well is the first part. The plan includes the well inventory during the pre- and post-monsoon seasons. The selection of the sampling site is based on the overall objectives of the present study, and the physicochemical parameters will be analyzed with respect to drinking and irrigation purpose.

The sampling and fieldwork will be carried out during the pre- and post-monsoon seasons for two years. The pre-monsoon samples will be collected in month of May, and the post-monsoon samples will be collected in month of December. Preparation of thematic maps by using GIS tools and techniques, Watershed map, drainage density map, contour map, Well location map, lineament map and preparation of DEM.

Field survey and sample analysis.

Detailed field surveys will be conducted by using gridding sampling method with

the help of GIS techniques, fixation of observation wells to collect and Analysis

of samples.

IMPORTANCE OF STUDY

International Status

The change in climatic condition have significantly affected the groundwater resources and its management. This cause to change in the availability of the groundwater in parts of the world. Despite being having high rainfall, some region facing the scarcity problems which could arises due to local factors such as geology, drainage, climate etc. Groundwater Potential is one of major concern about the groundwater availability its management through the globe.

The most recent Intergovernmental Panel on Climate Change (IPCC 2007) report noted a comparative lack of studies addressing the effects of climate change on groundwater. This challenge has been taken up by the groundwater research community and has resulted in an increasing focus towards the management of groundwater resource. [Green et al., 2011;Taylor et al., 2013], although there still remains many aspects of the climate change effects on groundwater that have not been well studied. **(Russell S et al., Potential climate change effects on groundwater recharge in the High Plains Aquifer, USA)**

Rapid growth in the population have stresses the groundwater resource for the socio-economic development in the shat Al-Arab basin. For the sustainable management and effective groundwater resources and management requires precise quantitative evaluation, which can be achieved by applying scientific principles and modern techniques. An integrated concept has been used in the current study to identify the groundwater potential zones (GWPZs) in the Shatt Al-Arab basin using remote sensing (RS), geographic information system (GIS), and analytic hierarchy process (AHP). (**Hadi Allafta et al., Identification of Groundwater Potential Zones Using Remote Sensing and GIS Techniques: A Case Study of the Shatt Al-Arab Basin)**

National Status

Among all other natural resources, groundwater is one of the most essential for environmental, biological, and socioeconomic activities. Several factors such as geology, distance from the river, geomorphology, slope, land-use, drainage density, lineament density, soil, and rainfall influence groundwater recharge and its availability. The integrated study includes Geographical Information System (GIS) based Multi-Criteria Decision Making (MCDM), Analytical Hierarchy Process (AHP), and remote sensing were used to evaluate the groundwater potential zone in similar drought-prone regions around the world. **(Arjun B. Doke et al., Geospatial mapping of groundwater potential zones using multi-criteria decision-making AHP approach in a hardrock basaltic terrain in India)**

Regional Status

Groundwater potential investigation is one of the most significant and crucial aspects in arid and semi-arid regions like Marathwada. Marathwada is often susceptible to water scarcity and drought due to monsoon variability. Therefore, it is indispensable to identify groundwater potential zones (GWPZs) to meet human needs. **(Uttam Pawar et al., Mapping of groundwater potential zones in a drought prone Marathwada Region using frequency ratio and statistical index methods, India)**

The chemical constitutes of the groundwater is the most crucial part as it controls the suitability for drinking and irrigation purpose. The chemistry of groundwater is mainly control by the precipitation, local geology, aquifer etc. An attempt has been in the bhokar taluka of Nanded district of Maharashtra for the investigation of groundwater chemistry. Physicochemical parameters such as pH, EC, TDS, Ca, Mg, Na, K, Cl, F etc have been analysed and compared to the standards. The study concluding that Higher concentration of fluoride is observed in the areas where the granitic rocks are encountered in dug/bore wells **(Dipak B Panaskar et al., Geochemical Characterisation of Fluoride Containing Groundwater from Sita Nadi Watershed, Bhokar Taluka, Maharashtra, India)**

SCOPE OF THE STUDY

The scope of the study is to demarcate the groundwater potential zone in bhokar taluka of Nanded district. The study area comes under the part of Marathwada region known for drought area. The proposed study aims to demarcate the groundwater potential in the study area by analyzing the various factor such as geology, geomorphology, lineament, slope, drainage density etc.

SIGNIFICANCE OF STUDY

Despite having normal to high annual rainfall in the study region, sometimes it faces the water scarcity problem in summer. To cope with this issue groundwater management is crucial factor which can be studied by identifying the potential and non-potential zone. This will help to identify the sensible zone for non-potential area which can be increases by recommending some recharge structures such as bandharas, recharge trenches, cement nallah bandh, recharge shaft etc. Also, the study includes the collection of groundwater samples for identification of potable and non-potable zone which ensure the quality of groundwater for drinking and irrigation purpose.

PROPOSED PLAN OF STUDY

1. In the first year, fieldwork in the proposed area will be conducted, along with a review of published literature on groundwater. Published data from GSI, CGWB, GSDA, and other institutions will be collected specifically for the study area.

In the second year, students engage in fieldwork to collect samples from bore wells, dug wells, and surface water sources. They analyze the samples and tabulate the data using various statistical methods.

3. Third year:

a) Interpretations of data
b) Writing a thesis
c) Presentation in seminars
d) Publication in research papers

EXPECTED OUTCOMES OF THE STUDY

The area will be demarcated in good and bad potential area by considering the various factors and the same will be validated through the field date. This will create the Groundwater Potential zone Map(GWPZ) of the area and accordingly the recommendation for the recharge structure will be provided at suitable site. Also, the study ensures the quality of groundwater for both drinking and irrigation purpose based on drinking and irrigation indices. This will help to identify the potable, non-contamination zone within the area.

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